Residue Management No-Till (329A)

Planting a Crop in Undisturbed Soil Utilizing Existing Residue

No-Till: The proper use of crop residue is one of the least costly tools available for controlling or reducing soil loss from water erosion. An important factor that influences residue use is the tillage operations performed between crop harvest and when the next crop is planted. The more crop residue left on the surface during critical erosion periods, the more intensively the land can be cropped and continue to maintain an acceptable level of soil erosion.

Benefits

Residue management no-till systems can be designed to accomplish one or more of the following:

- **Reduces water and herbicide runoff by 50% or more.**
- **Reduces soil erosion up to 90%.**
- **Conserves soil moisture up to 2 inches.**
- **Improves water infiltration.**
- **Improves long-term productivity by increasing soil organic matter.**
- **Reduces soil compaction.**
- **Improves water quality.**
- **Sequesters carbon - Plowing releases almost ten times as much carbon dioxide.**
- **Improves air quality.**
- **Provides food and cover for wildlife.**
- **Reduces equipment maintenance costs by as much as 5 dollars per acre.**
- **Reduces labor.**
- **Improves soil tilth.**
- **Increases earthworm populations.**

Guidelines

- **Distribute residue uniformly**. Equip combines or other harvesting machines with spreaders capable of distributing residue over at least 80 percent of the combine header width.
- **Limit secondary removal of crop residue** by baling or grazing. Retain the amount of residue needed to achieve the intended purposes.
- **Do not burn residue**.
- **Do not disturb residue** by full width tillage operations except for spot treatment of weeds or limited use of undercutting operations, such as sweeps or blades used to level ruts or alleviate compaction.
- **Leave residue standing** to maximize benefits to wildlife and improve equipment operation.
- **Use equipment properly**. Coulters and/or double disk openers must be run at the correct depth and speed to cut through surface residue and place seed at the proper depth. Good slit closure is required for soil seed contact.
- **Limit residue disturbance in the row**. Disturb no more than 1/3 of the row width by nutrient injection, row cleaning, planting, or other operations during the cropping season.
- **Row cleaners** may be attached to the planters to move residue out of the row area and help warm and dry the seedbed.
- **Injectors** must be able to operate in high residue. Anhydrous injectors, manure injectors, and similar equipment may need to be modified to operate in high residue.
- **Weed control strategy** must be carefully planned and implemented to maintain residues, control weeds, and maximize yields. Other pests should be closely monitored. Limit herbicide choices to non-incorporated. **CAUTION:** If pesticides or their containers are handled or applied improperly or if unused portions are not disposed of safely, they may be injurious to humans, domestic animals, desirable plants, and fish or other wildfire. Follow the directions and heed all precautions on the product label.
- **Maintain a minimum of 50% surface cover** to retain soil moisture for crop use by enhancing infiltration and reducing evaporation.

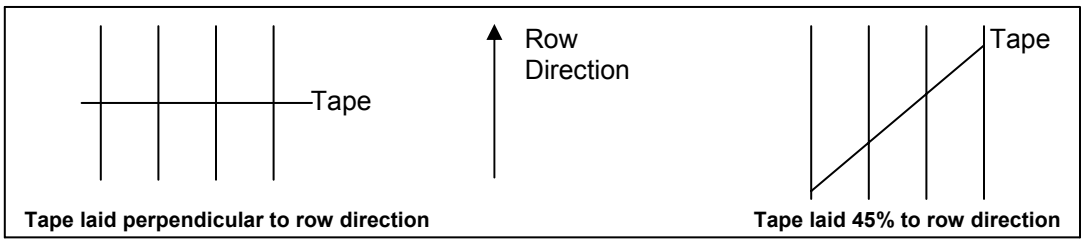
Tips from Tennessee Farmers

- **Soil test**. Take test early. Sample in the fall and apply lime if needed.
- **When planting in sod**, perform chemical burn down well in advance of planting (at least 2 months). In sod you may need to apply a second burn down prior to planting.
- **Increase seeding** rate by at least 10%.
- **Maintain planter.** Make repairs well in advance of cropping season.
- **Calibrate planting equipment** accurately to obtain desired plant populations, proper seed depth, and slot closure.
- **Recalibrate** drill when changing seed.
- **Plant at later seeding dates**.
- **Choose heavy yielding varieties** and increase plant populations even more to take advantage of higher yield potentials on the best soils.
- **Choose drought tolerant varieties** on thin upland soils.
- **Delay** planting on wetter bottom soils.
- **Monitor** soil temperature before planting.
- **Row direction.** On slopes greater than 7%, rows should be cross slope or contoured.
- **Use treated seed** when necessary.
- **Calibrate spray equipment**. Proper application rates and coverage are critical.
- **Insecticides** may be needed, especially with no-till corn in sod.
- **Pesticide labels.** Become very familiar with and follow label instructions.
- **Apply fertilizer** as indicated by soil test.
- **Nitrogen.** Reduce application amounts of commercial nitrogen fertilizers according to the residual nitrogen left from previously grown legume crops (i.e., crimson clover, vetch, soybeans, alfalfa).
- **Manure.** Reduce application amounts of commercial fertilizers according to the residual nutrients supplied by manure. Manure application within the last two to three years should be considered.
- **Scout** for insects and weed competition. Be prepared to use control measures when warranted.
- **Planting into small grain**. Plant crops following small grain diagonally to the direction of small grain harvest.

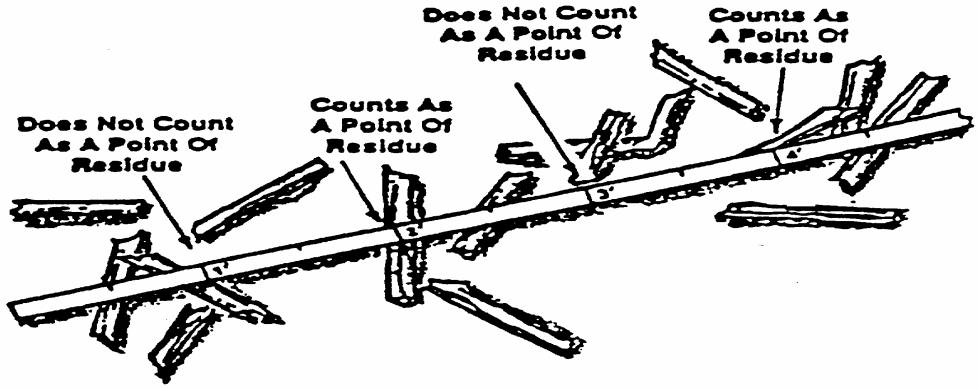
How to Measure Crop Residue Cover in the Field with the Line Transect Method:

At times, a producer finds it important or necessary to measure the actual percent of the ground surface covered by plant residue. The line transect method is an easy method of doing this. The following is the recommended procedure for using the line transect method:

1. **Use a commercially available 50- or 100-foot long cable, tape measure, or other line** that has equally spaced beads, knots, or gradations (marks) at one-foot increments.
2. **Select an area that is representative of the field as a whole and stretch the line** across the crop rows. The line may be oriented perpendicularly to the rows or in a direction that is at least 45 degrees off the row direction. Avoid measurements on end rows.



3. **Count the mark on the line** if there is residue under it that is large enough to intercept a raindrop (residue that is 3/32 inch in diameter or larger). Walk along the line, stopping at each mark. Position the eye directly over the mark, and look down at it. Look at the marks only at one side of the tape (See figure below). **For the 100-foot tape, percent residue cover is equal to the number of points counted. For the 50-foot tape, double the number counted to obtain percent residue cover.**



4. **Complete five transects** within a field or group of identically cropped fields and take the average of the counts to obtain percent residue cover.

For other sources of information, contact your Agricultural Extension Service, Certified Crop Advisor, chemical dealer, or the local conservation office. Additional reference publications include: U.T. PB 378 - *Crop Varieties*; U.T. PB 1061 - *Soil Testing*; and U.T. PB 1580 - *Weed Control Manual for Tennessee* (for field crops, forage crops, pasture, farm ponds, and harvest aids).

Residue Management No-Till

Use the following worksheets and charts in order to plan for 30% residue cover in your cropping system. NRCS personnel can assist you with this process.

Worksheet 1: Estimating Crop Residue Produced (for Planned Rotation)						
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Crop	**Harvest Units**	**Pound/ Unit**	**Harvest Unit per Acre**	**Residue Yield Ratio**	**Est. Residue/Acre** (Column 3x4x5)	**Estimated Percent Ground Cover** (Column 6 Interpolated from Chart 1)
Corn	bushel	56		1.00		
Soybeans	bushel	60		1.50		
Wheat	bushel	60		1.70		
Cotton	bale	500		4.50		
Grain Sorghum	bushel	56		1.00		

Chart 1: Residue pound/percent cover conversion					
Percent Cover	**Corn (Non-Fragile)**	**Soybeans (Fragile)**	**Cotton (Non-Fragile)**	**Grain Sorghum (Non-Fragile)**	**Small Grain (Non-Fragile)**
10%	250	250	400	300	250
20%	600	400	1,000	650	400
30%	950	600	1,600	1,050	600
40%	1,400	850	2,300	1,550	850
50%	1,850	1,200	3,200	2,100	1,200
60%	2,400	1,600	4,150	2,700	1,550
70%	3,300	2,100	5,300	3,600	2,100
80%	4,400	2,800	6,900	4,800	2,750
90%	6,050	3,900	-	6,750	3,850

Chart 2: Machinery Table		
Values Represent Percent of Ground Cover Remaining After the Operation	Percent for Fragile Residue (such as Soybeans)	Percent for Non-fragile Residue (such as Corn)
Over Winter	80%	95%
Anhydrous Appl.	85%	90%
No-till Plant	85%	90%
Chisel (Straight Shank)	75%	80%
Chisel (Twisted Shank)	40%	50%
Field Cultivator	75%	80%
Disk (before other tillage)	85%	90%
Disk (after other tillage)	40%	60%

Worksheet 2: Residue Budget Worksheet					
Previous Crop	**Beginning Residue**	**Operation**	**Date**	**Percent Residue**	**Percent Residue Remaining**
Soybeans	78%	Over Winter	4/1	80%	62%
"	62%	Anhydrous	4/15	85%	53%
"	53%	No-till Plant	5/1	85%	45%

Notes: The example completed above is a corn soybean rotation. After 30 bushels of soybeans have been harvested, the amount of soybean residue will be 2,700 pounds per acre, which equals 78% residue.
After anhydrous ammonia is applied and the field no-till planted, the remaining previous crop residue is 45%.